Space Weather Forecast

Issued on Tuesday 24 December 2024 at 01:29 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Minor/Moderate radio blackouts expected. Chance of G1/Minor Geomagnetic Storms 25-26 Dec.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate with several Moderate-class flares observed from the cluster of sunspot regions located in the southeast quadrant.

There are currently twelve sunspot regions on the visible disc. The southeast quadrant remains the focus of solar activity, containing a cluster of the three largest and most complex regions. Slow development of all regions were observed during the period with a potential complex magnetic configuration forming in the southern portion of the most actively flaring region. A small, unnumbered region developed in the southwest disc. Other remaining regions were relatively small, stable and more magnetically simple. A new region was seen rotating onto the facing-disc in the far northeast, but is not yet unnumbered.

A moderately-fast Coronal Mass Ejection (CME) associated with the Moderate solar flare and sympathetic filament (Arc of the Sun's plasma) eruption was modelled as an expected, flanking impact on 25 Dec, or perhaps early 26 Dec. Otherwise a number of other CMEs have been observed in available imagery during the period, but analysis of these suggests none have an Earth-directed component.

Solar Wind / Geomagnetic Activity: Solar winds were were elevated to strong, varying between 525-630km/s. The Interplanetary Magnetic Field (IMF), Bt, was initially moderate, but eased to become weak from around 23/0800 UTC. The important north-south component, Bz, varying weakly throughout, with no single direction predominant. Geomagnetic activity was Quiet to Unsettled (Kp1-3).

Energetic Particles / Solar Radiation: High energy proton flux was well below the S1/Minor Storm threshold, but slightly elevated above normal background levels, on a slowly declining trend.

Four-Day Space Weather Forecast Summary

Solar Activity: Further Moderate flares are likely, with a slight chance of isolated Strong flares maintained throughout.

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Solar Wind / Geomagnetic Activity: A Coronal Mass Ejection (CME) that left the Sun late 20 Dec has a chance to give Earth a glancing impact early on Day 1 (24 Dec). A moderately-fast CME on 23 Dec from a flare and subsequent filament eruption in the southeast disc is expected to result in a flanking impact on Day 2 (25 Dec), or perhaps arriving early Day 3 (26 Dec). No other potential Earth-directed CMEs feature in the forecast, however, due to the sheer number of CMEs in evidence in solar imagery over the past several days, this means confidence in this aspect of the forecast is lower than usual.

An ongoing enhancement to the fast-wind of a coronal hole, giving elevated wind speeds, is expected to continue until Day 2 (25 Dec) before slowly declining. Further connection to a coronal hole in the northwest disc is possible from Day 3 (26 Dec) onwards, but considered unlikely given its high-latitude location.

Geomagnetic activity is expected to be mainly Unsettled on Day 1 (24 Dec) with isolated Active intervals likely and very slight chance of peak G1/Minor Storm conditions. On Day 2 and 3 (25 and 26 Dec), dependent on any CME arrival, peak Active to G1/Minor Storm levels are expected, with a slight chance of G2/Moderate Storm intervals. By Day 4 (27 Dec), mainly Quiet to Unsettled activity is forecast, but with a chance of Active periods, especially at first.

Energetic Particles / Solar Radiation: There is a slight chance of Solar Radiation storms occurring during the period, increasing to a chance on Day 4 (27 Dec). In the absence of any further notable flares, ongoing slightly enhanced Solar Radiation counts should ease towards normal background levels in the coming days.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	**G1 to G2**	No	10	50	50	5
Strong	**G3**	No	1	10	10	1
Severe	**G4**	No	1	1	1	1
Extreme	**G5**	No	1	1	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	80	80	80	80
Very Active	R3-R5 (X Class)	No	15	15	15	15

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	20	20	20	25
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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